

First Named Inventor: Jeffery J. Hanson, et al.

Application No.: 09/845,566

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AMENDMENTS TO THE CLAIMS

Please amend claim 6; cancel claims 1-5, 11-15, 22 and 23; and add claim 24, such that the status of the claims is as follows:

1.- 5. (Canceled).

6.(Currently Amended) A modeling machine of the type which builds three-dimensional objects by depositing thermally solidifiable modeling material as a road of molten material having a height h into a build environment having a temperature lower than an extrudate temperature of the material, and from an extrusion head that moves at a known speed in a predetermined cross-sectional pattern, comprising:

a first supply of a first thermally solidifiable modeling material, in the form of a continuous filament;

a second supply of a second thermally solidifiable modeling material, in the form of a continuous filament;

a first thermally conductive dispenser carried by the extrusion head and having an inlet for receiving the first supply of the first thermally solidifiable modeling material and a tip for dispensing roads of the first material in molten form, the tip of the first dispenser having a downward face positioned in approximately a z-plane;

a second thermally conductive dispenser carried by the extrusion head and having an inlet for receiving the second supply of the second thermally solidifiable modeling material and a tip for dispensing roads of the second material in molten form, the tip of the second dispenser being maintained in a fixed vertical position relative to the tip of the first dispenser, and having a downward face spaced apart a distance s from the face of the first dispenser and positioned in approximately the same z-plane as the face of the first dispenser;

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The modeling machine of claim 1, wherein the dispensers are thermally conductive
~~and further comprising:~~

- a thermally conductive body in which the dispensers are carried;
- a thermal insulator positioned in the body so as to provide thermal separation between the dispensers;
- a means for heating the first dispenser to a temperature at which the first material is flowable; and
- a means for heating the second dispenser to a temperature at which the second material is flowable;

wherein the distance s is great enough that a road deposited by one of the tips will shrink due exclusively to cooling during a minimum transit time Δt between the tips such that the other one of the tips does not drag across and smear the road.

7.(Original) The modeling machine of claim 6, wherein the thermal insulator comprises ambient air that fills a cavity in the body.

8.(Original) The modeling machine of claim 6, wherein the thermal insulator comprises a solid material.

9.(Original) The modeling machine of claim 6, wherein the road has a thermal diffusivity K_e , and wherein the minimum transit time is characterized by the relationship $\Delta t = \frac{0.3h^2}{K_e}$.

10.(Original) The modeling machine of claim 9, wherein the extrusion head accelerates and decelerates through a path comprising multiple vertices and the tips have a minimum vertex velocity

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v_{\min} and a maximum acceleration a_{\max} , and wherein the spacing s is characterized by the relationship $v_{\min} \Delta t + \frac{1}{2} a_{\max} \Delta t^2 \leq s$.

11.- 15. (Canceled).

16.- 21. (Canceled).

22. (Canceled).

23. (Canceled).

24.(New) In a modeling machine of the type which builds three-dimensional objects by depositing thermally solidifiable modeling material as a road of molten material having a height h into a build environment having a temperature lower than an extrudate temperature of the material, and from an extrusion head that moves at a known speed in a predetermined cross-sectional pattern, the improvement comprising:

- a first thermally conductive dispenser carried by the extrusion head and having an inlet for receiving a first thermally solidifiable modeling material and a tip for dispensing roads of the first material in molten form, the tip of the first dispenser having a downward face positioned in approximately a z-plane; and
- a second thermally conductive dispenser carried by the extrusion head and having an inlet for receiving a second thermally solidifiable modeling material and a tip for dispensing roads of the second material in molten form, the tip of the second dispenser being maintained in a fixed vertical position relative to the tip of the first dispenser, and having a downward face spaced apart a distance s from the face of the first dispenser and positioned in approximately the same z-plane as the face of the first dispenser;
- a thermally conductive body in which the dispensers are carried;

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a thermal insulator positioned in the body so as to provide thermal separation
between the dispensers;
a means for heating the first dispenser to a temperature at which the first material is
flowable; and
a means for heating the second dispenser to a temperature at which the second
material is flowable.